INSTRUCTION MANUAL "ULTRASTART"

STARKPOWER's Lithium Iron Phosphate ($LiFePO_4$)rechargeable batteries require care in their use and handling. Read and follow the guidelines in this document to safely use Lithium batteries and achieve the maximum battery life span.

Overview

Do not leave batteries unused for extended periods of time, either in the product or in storage. When a battery has been unused for 6 months, check the charge status and charge or dispose of the battery as appropriate. The typical estimated life of a Lithium battery is about five to eight years or 2,000 to 3,000 full charge cycles, whichever occurs first. One charge cycle is a period of use from fully charged, to fully discharged, and fully recharged again. Use a five to eight years expectancy for batteries that do not run through complete charge cycles but can last over 10 years. Battery life is mostly dependent on ambient temperature in which hotter weather will degrade the batter faster. Rechargeable Lithium batteries have a limited life and will gradually lose their capacity to hold a charge. This loss of capacity (aging) is irreversible. As the battery loses capacity, the length of time it will power the product (run time) decreases. Lithium polymer batteries continue to slowly discharge (self-discharge) when not in use or while in storage. Routinely check the battery's charge status. The product user manual includes information on how to check battery status, as well as battery charging instructions.

INSTALLATION

Before installing the battery, turn off all systems. Make sure it is completely safe to remove the battery currently installed. Remove your current battery by disconnecting the negative wire first, then the positive wire. After disconnecting the wires you can remove the current installed battery. Now place your new StarkPower battery inside the battery compartment. Reconnect the positive wire first, then the negative wire. Make sure that you connect the negative wire on the (–) pole of the battery and the positive wire to the the (+) pole of the battery.

BATTERY MAINTENACE

- Observe and note the run time that a new fully-charged battery provides for powering your product. Use this new battery run time as a basis to compare run times for older batteries. The run time of your battery will vary depending on the product's configuration and the applications that you run.
- Routinely check the battery's charge status.
- Carefully monitor batteries that are approaching the end of their estimated life.
- Consider replacing the battery with a new one if you note either of the following conditions:
    - The battery run time drops below about 80% of the original run time.
    - The battery charge time increases significantly.
- If a battery is stored or otherwise unused for an extended period, be sure to follow the storage instructions in this document. If you do not follow the instructions, and the battery has no charge remaining when you check it, consider it to be damaged. Do not attempt to recharge it or to use it. Replace it with a new battery.

OVERVIEW

StarkPower Lithium batteries are designed as a maintenance free drop-in replacement for the Original Equipment Manufacturers (OEMs) 12 volt lead-acid battery. To ensure a seamless replacement process, StarkPower's are identical or smaller than the OEM batteries. The StarkPower battery consists of Lithium Iron Phosphate (LiFePO4) cells with integrated cell monitoring and balancing circuitry inside each battery case. Use individual chargers on each 12V battery if putting 12V batteries in series. It is best to purchase 24V or 48V batteries if running higher voltages. Unlimited number of 12V batteries can be put in parallel.

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TECHNOLOGY INSIDE (Battery Cells)

Our batteries use cells made of Lithium Iron Phosphate (LiFePO4) technology. This chemistry is one of the highest performance and safest on the market today. Lithium batteries are fundamentally different than lead-acid batteries. A lithium battery's voltage remains relatively constant while discharging, while voltage for a lead-acid battery decreases. A lithium battery can use 100% of its storage capability (measured as Amp-Hour, Ah); while a lead-acid battery typically only uses 30%. A 2Ah lithium battery has the equivalent capacity to a 6Ah lead-acid. Lithium battery's power level will not drop-off, and it will last longer. But when the lithium battery runs out of power it does so abruptly.

BATTERY MANAGEMENT SYSTEM (BMS)

The StarkPower's battery's integrated BMS continuously monitors each cell's voltage to prevent damage from happening. If the voltage of a cell exceeds the others, the BMS circuits will transfer charge from that cell to the others in the battery. This ensures that the charge level of all cells remains equal, even with the high discharge and charge current.

A cell can be permanently damaged if over charged (over-voltage) or over discharged (undervoltage) just one time. In the case of over-charging (battery voltage > 16V or cell voltage > 4V), an individual cell can rupture, and the entire battery will need to be replaced. Our lithium cells together with our BMS create the safest battery on the market, with more starting power, and longer life.

Lithium cell's charge level will diverge with repeated charge/discharge cycles and age. This condition reduces the performance of the battery (reduces capacity), for the battery charge level is only as good as the charge level of the weakest cell. Moreover, charging a battery with unbalanced cells results in one or more cells reaching the maximum charge (voltage) level before the rest of the cells in the series, which leads to over-charging of the cell(s). The same is true for discharging. Inside every one of our batteries is a microprocessor battery management system. In the event a lower cut-off voltage is reach, the battery terminals will have 0V on them. The battery needs to be "kick started" with a charger (using a StarkPower charger) that has a battery voltage on the terminals. That will turn ON the battery again and start taking a charge. Some charges need to sense the battery voltage first, thus will not turn on or take a charge. In the event over-charging condition is reached, the battery terminals will have 0V. Turning off the charger and letting the battery rest a couple minutes should allow the battery to turn ON again and operate.

IQ RESTART TECHNOLOGY

"IQ RESTART TECHNOLOGY"- protects the battery from a deep cycle discharge by monitoring battery voltage level and shutting its power off before reaching a full discharge condition, as in the case of leaving a headlight or electrical component on for an extended period of time while the engine is off and not charging. Adequate reserve power is left in the battery, to automatically detect starting effort and allows users to start the engine again and not leaving you stranded or with the headache of calling for service or even needing to replace the battery.

CHARGING

Always use StarkPower's charger with your Lithium battery. The "constant voltage/constant current" method is used to charge lithium polymer batteries.

- Charge Voltage: The maximum charge voltage is 14.6V
- Charge Current: The maximum charge current is 1C or AH * 1C=> A. For example 12Ah battery has a max charge of 12Ah*1C=> 12A.
- Charge Temperature: The batteries should be charged at temperatures between 0°C and 45°C. Charging when the battery is below 0°C will damage the battery.

- When charging, connect the battery to the charger and then plug the charger into a standard wall socket. The charger body will display a red light if the battery requires a charge. When the battery is completely charged, the light will turn from red to green and the charger will shut off automatically.

STORAGE

- Charge or discharge the battery to approximately 80% of capacity before storage.
- Charge the battery to approximately 80% of capacity at least once every six months.
- Remove the battery and store it separately from the product.
- Store the battery at temperatures between 5 °C and 20 °C (41 °F and 68 °F).

NOTE. *The battery self-discharges during storage. Higher storage temperatures (above 25 °C or 77 °F) reduce the battery storage life.*

HANDLING PRECAUTIONS

- Do not disassemble, crush, or puncture a battery.
- Do not short the external contacts on a battery.
- Do not dispose of a battery in fire or water.
- Do not expose a battery to temperatures above 60 °C (140 °F).
- Keep the battery away from children.
- Avoid exposing the battery to excessive shock or vibration.
- Do not use a damaged battery.
- If a battery pack has leaking fluids (electrolyte), do not touch any fluids. Dispose the leaking battery pack (see *Disposal and Recycling* in this document).
- In case of eye contact with fluid, do not rub eyes. Immediately flush eyes thoroughly with water for at least 15 minutes, lifting upper and lower lids, until no evidence of the fluid remains. Seek medical attention.

TRANSPORTATION

- Always check all applicable local, national, and international regulations before transporting a Lithium-Ion battery.
- Transporting an end-of-life, damaged, or recalled battery may, in certain cases, be specifically limited or prohibited.

DISPOSAL AND RECYCLING

- Lithium polymer batteries are subject to disposal and recycling regulations that vary by country and region. Always check and follow your applicable regulations before disposing of any battery. Contact Rechargeable Battery Recycling Corporation (www.rbrc.org) for U.S.A. and Canada, or your local battery recycling organization.
- Many countries prohibit the disposal of waste electronic equipment in standard waste receptacles.
- Place only discharged batteries in a battery collection container. Use electrical tape or other approved covering over the battery connection points to prevent short circuits.

WARRANTY

StarkPower offers a 1 YEAR WARRANTY.
StarkPower battery warranty is for function only. Warranty does not cover physical damage, misuse, or improper charging. StarkPower is not liable for any damage to either person or personal property resulting from the use of this product. If the battery is physically damaged in any way, the claim will be denied.

- Conditions NOT covered under warranty:

- Hard Short of terminals by direct contact.
- Physical Damage to the battery occurring after purchase (impact, etc)
- Cell chemistry damage as a result of being drained below 9.0 Volts.
- Abuse or physical damage as a result of a defective or improper external charger.
- Over charging or damage as a result of a defective or improper external charger.
- Over charging or damage as a result of a defective on board charging system.
- Damage from use in excess of cranking capacity.
- Damage to terminals due to torque in excess of 5ft-lbs. 12in-lbs.

- All warranty claims are handled by StarkPower directly. All warranty claims must be accompanied by the **original receipt** from your retailer.
- Warranties are non-transferable and meant for the original owner only. Returns will only be accepted from the original owner. A return authorization number must be acquired from StarkPower before the battery is shipped. If a battery is received without a Return Authorization Number or without the original invoice then the battery will be returned to the original shipper COD.
- Warranty claim battery must be in StarkPower possession before any replacement battery can be shipped out.
- Each StarkPower battery is only eligible for one warranty replacement. Once a battery has been warranted the replacement battery only holds the remainder of the warranty period of the original battery purchased.
- All shipping charges, insurance and any damaged incurred during shipping for any and all warranty claims is the customer's responsibility. If the battery is determined to be defective, StarkPower will pay for return shipping of the replacement battery back to the customer (within the continental US only) by ground shipping only. If the battery is NOT defective, or the battery originated outside the continental US, shipping back to the customer will be at the customer's expense.
- If the battery used in sanctioned competition of any kind, abused or used in a manner for which it was not intended the warranty if void.
- StarkPower reserves the right to deny any and all claims if all conditions and terms are not met.

NON-WARRANTY RETURNS

Any merchandise in "new" condition which was originally purchased via the Starkpower website may be returned to StarkPower within 30 days of purchase. For "as new" returns to other sellers, please consult your seller for their terms. Merchandise must be accompanied by a Return Authorization Number, copy of receipt or order number, and all original packaging in "new" condition. Refunds will be granted less the actual original shipping cost if it was a "free shipping" item. A restocking fee may be assessed - or refund entirely refused - in case the product or packaging is damaged, depending on severity.

SHIPPING DAMAGE

Any item damaged in transit must be reported to the SHIPPER IMMEDIATELY upon opening of the package, and also StarkPower. All original packaging must be retained until further notice. StarkPower will respond with instructions, after consultation with the shipping agent.

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Performance my vary depending on application.
All specifications and operating conditions are subject to change without notice.